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UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

Project | Date | Author

TITLE

SECOND PROGRESS REPORT - FANDANGO THINNING EXPERIMENT

(An Experiment in Thinning Ponderosa Pine-White Fir Pole Stands to Control Mountain Pine Beetle)

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by
C. I. Eaton
Berkeley, California
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SECOND PROGRESS REPORT - FANDANGO THINNING EXPERIMENT

(An Experiment in Thinning Ponderosa Pine White Fir Pole Stands to Control Mountain Pine Beetle)

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SECOND PROGRESS REPORT - FANDANGO THINNING EXPERIMENT

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INTRODUCTION

Investigations made during the season of 1938 on the Fandango Logging Chance in the North Warner District of the Modoc National Forest revealed that the mountain pine beetle (Dendroctonus monticolae Hopk.) has caused extensive losses in second growth ponderosa pine-white fir pole stands. In several areas, losses in pine resulting from the attacks of this insect were found to have caused the conversion of the stand composition from pine-fir to pure fir, a change which is economically undesirable. In an attempt to determine whether or not this type conversion could be halted through the application of silvicultural methods, an experiment was established to test the efficacy of thinning in favor of the pine as a means of indirectly controlling the insect. This experiment was predicated on the supposition that the mountain pine beetle tends to select the weaker trees, particularly during periods when infestations are endemic. It is hoped that the experiment will demonstrate that the losses may be prevented through the production of more vigorous individuals by removal of some of the competition.

The mechanics by which the thinning study was set up have already been described in a previous report (Eaton, 1939). It suffices to say here that the experiment was designed to follow the reactions of individual trees. One hundred and twenty ponderosa pine poles were selected as crop trees on duplicate plots, and cuttings were made of both pine and fir to provide complete release within 4, 8, and 12 foot distances of the leave tree. Unthinned checks were also selected.

During 1939 the writer examined the thinning plots during June and September for the purpose of checking on the activities of insects during the first year after thinning.

INSECT ACTIVITY DURING 1939

During the past season, bark beetle attacks on ponderosa pine in the pine-fir pole stands continued at the same rate as in the past. In the areas in which the thinning plots are located, insect activity may have been slightly accelerated due to disturbances caused by the thinning operations and logging activity in adjacent mature stands. The white fir seemed to be relatively free from injury from the fir engraver beetle and other insects.

Injury to Crop Trees

The mountain pine beetle and the red turpentine beetle (Dendroctonus valens Lec.) both attacked ponderosa pine poles selected for release. Most of the attacked trees were infested by but one species, but a few were hit by both. A summary of the number of trees attacked, and the mortality on each plot is presented in Table I.

TABLE I

Mortality of Ponderosa Pine Leave Trees During First Year after Thinning

Radius of Area Cleared	Number of Treatments	Infested By D. valens Attacked	Killed	D. monticolae Attacked	Killed	D.valens-D.monticolae Attacked	Killed
		Plot No. 1					
0 feet	40			2	1	0	
4	40	4	0	3	1	0	
8	40	8	0	4	1	0	
12	40	12	0	1	0	0	
Total	160	24	0	10	3	0	
		Plot No. 2					
0 feet	40	0		0		0	
4	40	5	0	5	1		1*
8	40	5	0	2	2	3	0
12	40	7	0	4	0	2	0
Total	160	17	0	11	3	5	1*

* Killed by causes unknown.

These data show that the mountain pine beetle attacked 21 out of the total 320 crop trees, but was successful in killing only 6, or 1.88 percent. Mortality by treatments on both plots was as follows:

Radius of Area Cleared	Number of Trees Killed	Percent Killed
0 feet	1	1.25
4	2	2.50
8	3	3.75
12	0	0

Inasmuch as the pine was growing at an extremely slow rate prior to release, it is not considered that the time elapsed since treatment is sufficient to permit appreciable recovery, or acceleration in growth. Thus some mortality, such as has occurred this season, is to be expected. The lack of mortality in the 12 foot treatment is not considered significant, and is probably accidental.

The red turpentine beetle was particularly active in initiating attacks on released trees (Table I), especially in cases where pine was cut in releasing the crop tree. The population of this species is undoubtedly higher than normal in the Fandango area because of current logging activity in mature pine stands. Nearly 15 percent of the crop trees were attacked, but the beetle was not successful in causing death in a single case. The data presented in Table 2 show that the incidence of attack was much higher where one of twin or multiple stems was retained as the leave tree, than in cases where only single stems were involved.

TABLE II

Summary of Dendroctonus valens Attacks on
Ponderosa Pine Leave Trees

Radius of Area Cleared	Single Stem Treatments			Twin or Multiple Stem Treatments		
	Total Number	Number Attacked	Percent Attacked	Total Number	Number Attacked	Percent Attacked
0 feet	0	0	0	0	0	0
4	65	2	3.1	15	7	45.7
8	56	3	5.4	24	13	54.2
12	56	7	12.5	24	14	58.3
Total	177	12	6.8	63	34	54.0

Inasmuch as no mortality resulted from the activities of D. valens, this insect is not considered of consequence in this study. However, it is significant that the cutting of twin or multiple stems of pine in the thinning operations did not result in the death of the leave trees from the attacks of this insect.

Injury to the Residual Stand

The unthinned pine poles in and around the thinned trees continued to suffer injury from current activities of the mountain pine beetle. Surveys made by the writer and J. M. Miller late in September showed that approximately two pine poles per acre per year have been killed during 1938 and 1939. Maps of the location of current loss centers on the plots show

that the six crop trees which were killed by the mountain pine beetle this season were located near current infestations.

The western pine beetle (Dendroctonus brevicomis Lec.) was active in one small group of mature trees on one plot. This species attacked pine material which was felled in the thinning operations in fairly large numbers. "Souring" of the phloem, however, produced conditions unfavorable to larval development, and no emergence occurred from this material.

It was not possible to go into any further study of growth rate of pine poles in relation to susceptibility to attack by mountain pine beetle, as planned for this season. The suggestion that defoliation of the fir by spruce budworm (Harmologa fumiferana Clem.) may have liberated the pine in times past is worthy of more detailed investigation than it has been possible to give to it this season. That this insect has occurred in previous years is a matter of definite record, since Keen (1922) recorded heavy defoliation of white fir throughout the North Warner Range in 1921. In 1928 Craighead noted an active outbreak of the budworm on white fir in the vicinity of Cedarville Pass, about 20 miles south of the Fandango area. He also found evidence of previous defoliation in 1915 and 1922 in the form of abnormalities in annual growth. The writer has observed narrow growth rings for 1922 and 1923 in the majority of the cores taken from the older firs on the thinning plots, but no consistent relationship was found for other recent periods, possibly due to the lack of sufficient samples. Scouting in the Fandango area by J. M. Miller and the writer late this season failed to reveal the presence of spruce budworm at this time.

RESISTANCE OF WHITE FIR TO GIRDLING

Girdling as a means of killing the larger white fir trees has been an outstanding failure thus far in this experiment. Although the girdled trees were in all cases ringed by notching into the sapwood to a depth of ½ to 1 inch with an axe, the fir survived the first season in nearly all cases. The girdled trees put on new terminal growth in 1939, and callous tissue was formed by the cambium above and below the injury. It remains to be seen whether or not the trees will continue to survive.

PLOT MAINTENANCE

Practically no maintenance work was necessary on the plots in 1939. The metal number tags on the crop trees were all in place, and paint numbers and boundary markings seemed to be standing up very well. About one half day's work was necessary to clear out lines, but otherwise the plot setup was intact.

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BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
FOREST INSECT INVESTIGATIONS

PINE BEETLE HAZARD ZONATION
SISTERS AREA
DESCHUTES NATIONAL FOREST, OREGON
1944

LEGEND

AREA BOUNDARY — UNIT BOUNDARY

BEETLE HAZARD VERY HIGH — OVER 26 PERCENT OF THE STAND IN HIGH RISK TREES
DEPLETION SEVERE AND CONTINUING. REMAINING VALUES SHOULD BE SALVAGED AT ONCE

BEETLE HAZARD HIGH — 18–26 PERCENT OF STAND IN HIGH RISK TREES
DEPLETION HEAVY AND EXPECTED TO CONTINUE ON LARGE SCALE

BEETLE HAZARD MODERATE — 10–17 PERCENT OF STAND IN HIGH RISK TREES
DEPLETION MODERATE AND LIKELY TO CONTINUE FROM FREQUENT INFESTATIONS

BEETLE HAZARD LOW — 5–9 PERCENT OF STAND IN HIGH RISK TREES
DEPLETION NEGLIGIBLE. LOSSES MOSTLY BALANCED BY GROWTH

BEETLE HAZARD VERY LOW — 0–4 PERCENT OF STAND IN HIGH RISK TREES
DEPLETION NONE. LOSSES WILL BE NEGLIGIBLE

NON-RESTOCKING AREAS

CUTOVER AREAS (AS OF JANUARY 1, 1944)

SCALE 1 INCH = 4 MILES

PORTLAND FOREST INSECT LABORATORY, 445 U. S. COURT HOUSE, PORTLAND, OREGON MARCH 26, 1945